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Marine spatial planing and the Great Barrier Reef Marine Park Act 1975: An evaluation

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ABSTRACT

The Great Barrier Reef is internationally recognised for its natural and heritage value. Australian Government established the Great Barrier Reef Marine Park under the Great Barrier Reef Marine Park Act, 1975. The Act provides a legal regime for the protection of the natural and heritage values of the Reef. The Act incorporated spatial zoning and Marine Spatial Planning (MSP) to achieve the objective of ecologically sustainable use and management. The Act applies many principles including Ecosystem-Based Management (EBM) to achieve the objective. The current management mechanism under MSP has a significant achievement in the protection of the Reef region. However, there are many shortcomings of the Act to achieve the objective of ecologically sustainable use and management. Protection of ecosystem health, resilience, marine pollution and risk of climate change are the challenges that the Park faces. This paper analyses the shortcomings and achievements of the Act based on the Review Report, 2006, the Outlook Report 2009 and the Outlook Report 2014. The analysis explores that the overall performance of the Act is poor. Therefore, this research recommends for new management practice under a strategic action plan. The Plan should provide adequate protection against the new challenges that the Park faces.

1. Introduction

The Great Barrier Reef is one of the largest, richest and most diverse marine ecosystems of the world (UNESCO, 2018). The reef represents about 10 percent of the world's coral reef areas (Outlook Report, 2009). Because of its natural significance, the Reef was included in the World Heritage list in 1981 and declared a particularly sensitive area (PASSA) in 1990. The Australian Government enacted the Great Barrier Reef Marine Park Act, 1975 (the Act) for conservation and sustainable management of the Reef. The main objective of the Act is to provide the long-term protection and conservation of the environment, biodiversity and heritage values of the Great Barrier Reef Marine Park (the Park).[1] Moreover, the Act aims to achieve ecologically sustainable use of the natural resources of the Park by Ecosystem-Based Management (EBM).[2] Ecosystem based management is an environmental management approach that recognises the full array of interactions within a marine ecosystem, including humans, rather than considering single issues, species, or ecosystem services in isolation (Katsanevakis et al., 2011). The Act provided different zoning of the Park for a better spatial organization of human activities and of resource exploitation, so that user-user conflicts as well as user-environment conflicts are avoided (Kenchington and Day, 2011). Subsequently, the Act incorporated Marine Spatial Planning (MSP) in 2003. MSP is a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives (Ehler et al., 2009). An increasing number of countries are using MSP to achieve both sustainable use and biodiversity conservation in ocean and coastal areas (Katsanevakis et al., 2011). MSP in the Park is exemplified as an effective implementation of spatial arrangement for ecologically sustainable use of the marine resources and protection of the ecosystem (Day, 2015). MSP in the Park has achieved a significant progress in minimizing conflicting human activities, conservation of biodiversity and maintaining a balance between economic and environmental interests. However, a question remains to what extent MSP has achieved ecologically sustainable use of the Park due the current threats of marine pollution, climate change and growing competition among sea uses that the marine ecosystem faces.

The objective of this paper is to analyse the achievements and shortcomings of the Act to achieve ecologically sustainable use through EBM. The paper concludes with some recommendations to review the Act for more effective implementation of EBM to achieve the objective of ecologically sustainable use.

2. Methodology

This research is a qualitative research based on primary and supporting data. The Marine Park Act 1975, Review Report 2006, Intergovernmental Agreement, 2009, Zoning Plan, 2003 and the Outlook Report, 2009, 2014 are the primary data. The Outlook Reports are the axis of the research. The supporting data includes published

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[1] Section 2A (1) of the Great Barrier Reef Marine Park Act, 1975

[2] Section 2A 2(a)of the Great Barrier Reef Marine Park Act, 1975

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books, articles and thesis related to MSP in the Park. The whole research is divided into three phases: the first phases analyses the period from 1975 to 2006; the second phase analyses from 2006 to 2009; and the third phase analyses from 2009 to 2014. The researchers apply a comparative approach to evaluate the performance of the Act in the implementation of MSP. Kenchington and Day (2011), conducted the evaluation based on the phases/time. The present research evaluates the performance of the Act based on the phases/time and expands to the specific assessment items. Moreover, it includes the latest reporting, data and information to present the current status of the Park.

In the evaluation of performance of the Act from 1975 to 2006, the researchers analyse the achievements and shortcomings of the Act identified by the Review Panel Report, 2006. Then the Act is evaluated from 2006 to 2009 based on the Outlook Report, 2009, which is documented in Table 3. Table 3 compares the performance under the Review Report, 2006 and the Outlook Report, 2009. The performance of the Act from 2009 to 2014 is evaluated based on the Outlook Report, 2009, 2014, which is demonstrated in Table 4. Finally, the researchers make concluding remarks based on the findings those are explored from the comparative study of the Review Report, 2006 and Outlook Report, 2009, 2014.

3. Ecosystem based management and marine spatial planning

EBM is an integrated approach to manage human activities in ocean for preventing marine pollution and protecting the marine ecosystem. The OSPAR and HELCOM statement defines Ecosystem approach as the comprehensive integrated management of human activities based on the best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences that are critical to the health of marine ecosystems, thereby achieving sustainable use of goods and services and maintenance of ecosystem integrity (OSPAR-HELCOM, 2003).

According to the Act, EBM means an integrated approach to managing an ecosystem and matters affecting that ecosystem, with the main object being to maintain ecological processes, biodiversity and functioning biological communities.[3] EBM provides an important framework for assessing biodiversity and ecosystem services along with implementing potential responses (Douvere, 2008). EBM includes maintenance of ecological integrity, intergeneration of planning and management for multiple uses, promotion of ecologically sustainable industries, clear governance arrangements, planning and management that accommodates uncertainty, and use of the precautionary principle (Hassan, 2013).

EBM requires integrated management system, which should identify the human activities that may cause threat to marine ecosystem and restricts those activities to achieve sustainable use of ocean resources as well as to maintain integrity of ocean ecosystem. MSP is a process which provides integrated management system and establishes more rational use of marine space and creating interactions among various uses by balancing between demands for development and the protection of environment (Ehler et al., 2009). MSP provides planning and management for various human activities in a manner which helps to maintain the integrity of the marine ecosystem and to ensure uses of ocean resources at an acceptable level (Alder and Ward, 2001). The successful development and implementation of EBM requires new tools, such as geospatial analysis, remote sensing, molecular techniques, telemetry, modelling, and quantitative analysis to understand the spatial and temporal dynamics of marine organisms and ecosystems (Katsanevakis et al., 2011). MSP is the process which allocates ocean space based on scientific data and consideration of cumulative effect of the permitted human activities in ocean (Halpern et al., 2008). Ecosystem based MSP aims to bridge the gap between science and practise and help fill the current need of both governments and nongovernmental organisations for more practical tools that move forward the implementation of ecosystem-based management in marine places (Douvere and Ehler, 2009).

4. The Great Barrier Reef Marine Park

The Park was declared in many sections between 1979 and 2001 and amalgamated into one section in 2003 (Outlook Report, 2014). The Park contains a large area of 344,400 km^2 and includes approximately 70 Commonwealth islands, all waters seaward of low water mark excluding Queensland internal waters (Outlook Report, 2014). The Park represents a significant ongoing ecological and biological processes and contains the most important and significant natural habitats (Outlook Report, 2014). The Park is internationally recognised for its outstanding biodiversity. The world heritage status of the Park recognises its great diversity of species and habitats. The Park is a very large zoned multiple uses area, which fulfils four of the six components of protected areas prescribed by IUCN: strict nature reserve (865 km^2), national park (114715 km^2), habitat/species management area (15040 km^2) and protected area with sustainable use of natural resources (213780 km^2) (Kenchington and Day, 2011). The Park permits a wide range of activities including fishing, ports and shipping, recreation, defence activities, marine tourism, scientific research and indigenous traditional use (Merrie, 2010). The location and boundary of the Park are shown in Map 1.

5. Current arrangements to implement MSP in the great barrier reef

5.1. The Great Barrier Reef Marine Park Act 1975

The Act incorporates various principles for ecologically sustainable use of the Park including EBM, Integrated Decision-Making Process, Precautionary Principle, Principle of Intergeneration Equity, Improved Valuation and Incentive Mechanisms.[4] The Act contains both substantive and procedural provisions for the implementation of MSP. Now, the Act is structured with nine parts. An overview of the Act is presented in Table 1.

5.2. Great Barrier Reef Zoning Plan 2003

Zoning is a tool for the formation of MSP guidelines and regulation. Zoning was adopted as the key option for the spatial management of the Park. Although zoning was initiated in 1983 in the Park, the core concept was implemented by the Great Barrier Reef Zoning Plan 2003 (Zoning Plan). The Zoning Plan provides for a range of ecologically sustainable recreational, commercial and research opportunities and for the continuation of traditional activities (Kenchington and Day, 2011). According to the Zoning plan, there are eight zones: general use zone, habitat protection zone, conservative park zone, buffer zone, scientific research zone, marine national park zone, preservation zone and commonwealth islands zone. The current Zoning of the Park is shown the Map 2.

5.3. 2006 review of the Great Barrier Reef Marine Park Act 1975

The current provisions of the Act are the reflection of the recommendations provided by the Review Panel in 2006. The review considered a total of 227 substantive submissions from various interested parties and focused on the role of office holders; the functions of the Authority; accountability frameworks; and consultation mechanisms (Review Report, 2006). The Review Panel was required to advice

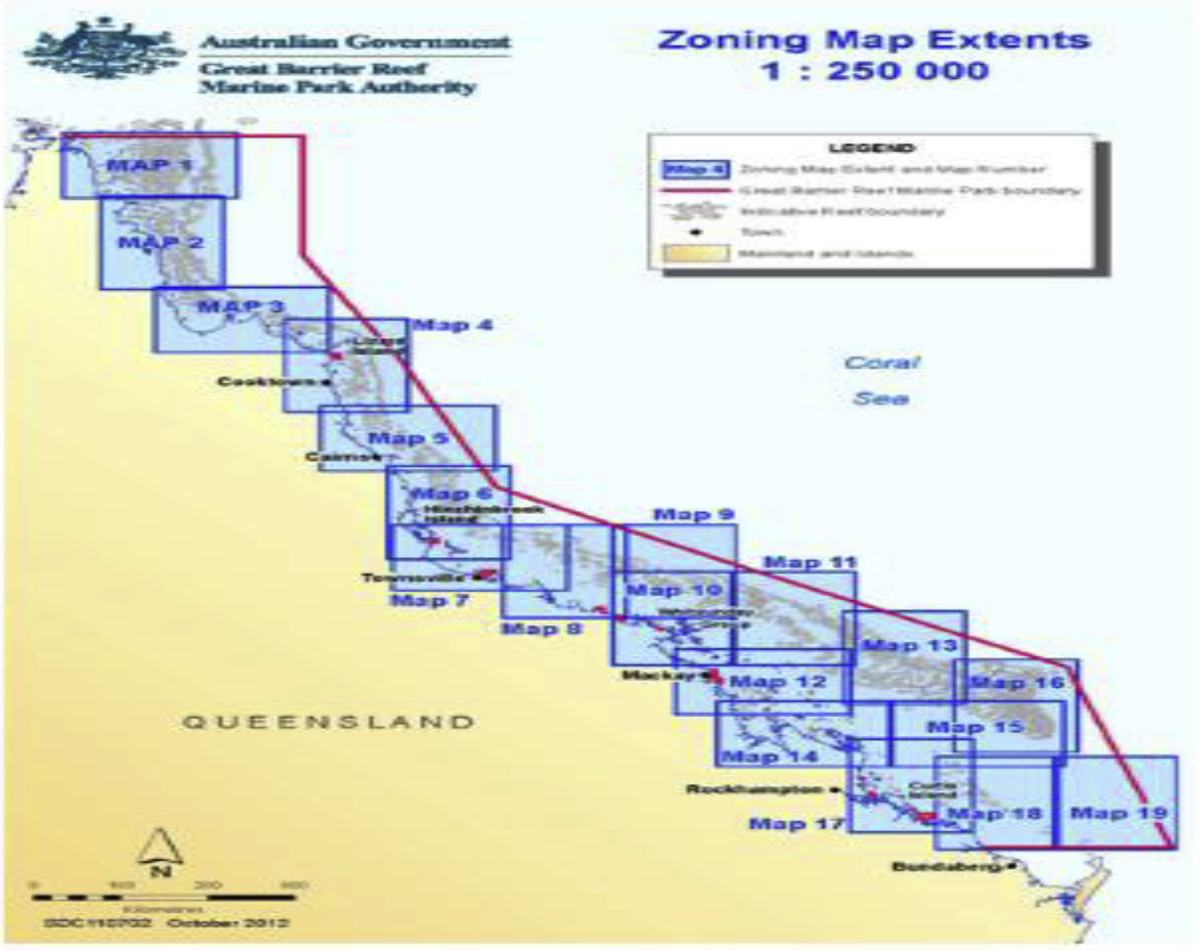
[3] Section 3 of the Great Barrier Reef Marine Park Act, 1975

[4] S 3AB of the Marine Park Act.

Map 1. Great Barrier Region indicative of the Great Barrier Reef Marine Park. Source: The Outlook Report, 2014, p.6.

Table 1
Overview of the Great Barrier Reef Marine Park Act 1975.

Part	Subject matter(s)	Provisions
Part I	Preliminary, Objectives and Principles	Applicable principles and Definition of the key terminologies
Part II	Establishment, functions and powers of the Great Barrier Reef Marine Park Authority	Institutional framework
Part III	Constitution and meetings of the Authority	Institutional Management
Part IV	The Great Barrier Reef Marine Park	Areas of the Park, Zoning Plans and Legislative Hierarchy
Part VAA	Offences and penalties in relation to Great Barrier Reef Marine Park and Region	Conduct in different Zones and aggravated offences
Part VA	Collection of environmental management charge	Liability and recovery of charge
Part VB	Plans of management	Preparation of plans of management
Part VI	Administration	Staff of Authority
Part VII	Finance and reporting requirements	Financial management and Reporting
Part VIIA	Compulsory pilotage	Pilotage and certificate
Part VIII	Enforcement	Enforcement powers
Part IX	Miscellaneous	Reconsideration and review of decision



Map 2. Zoning of the Great Barrier Reef Marine Park. Source: http://www.gbrmpa.gov.au/zoning-permits-and-plans/zoning/zoning-maps.

on the appropriateness of current arrangements; the efficiency and effectiveness of current consultation mechanisms; any changes to improve the corporate governance arrangements of the Authority; any adjustment of the function of the Authority; improving consistency between the Marine Park Act and the EPBC Act; and any legislative amendments required to make such changes (Review Report, 2006).

The Report explored that the Park Authority achieved success in establishing a multi-layer uses marine Park, which enhanced the economic benefits and social service of recreation and cultural values of a wide range of people (Review Report, 2006). However, this has been widely acknowledged that further initiatives are essential for the conservation of marine biodiversity. Although there were economic, social and cultural enhancements to some extent, the individual elements are generally fragmented and have a greater emphasis on the biophysical, with far less attention to the social and economic aspects. The research also explores that the planning processes, performance assessment and management decision making is not sufficiently clear (Review Report, 2006). The Act was less effective in the protection of environment of the Park and couldn't ensure a consistent management therein (Review Report, 2006).

The Review Report identified three areas that need to be addressed to meet future requirements. Firstly, the Act needs to be brought up to date and better aligned with the Environment Protection. Secondly, it is important that issues arising from overlaps and gaps in Commonwealth

and Queensland legislation are addressed to deliver streamlined and consistent environmental impact assessment, approval and permit processes for business and the community. Thirdly, the compliance provisions in the Great Barrier Reef Marine Park Act, 1975 are less robust than in its more modern counterpart, the Environment Protection and Biodiversity Conservation Act 1999 (Review Report, 2006).

5.4. 2009 intergovernmental agreements

As a sign of high level cooperation as well as a symbol of inter-agency cooperation in managing and protecting the Park, an agreement between the Australian Federal and Queensland governments was adopted in 1979. The agreement focused on a number of issues including the establishment of a Queensland-Commonwealth Council on the Marine Park Region (Review Report, 2006). Although a series of collaborative arrangements have evolved since 1979, both governments agreed to update the 1979 agreement. As a result, 2009 Great Barrier Reef Intergovernmental Agreement was signed. The objectives of 2009 Agreement are to provide the long-term protection and conservation of the environment and biodiversity of the reef ecosystem; to allow ecologically sustainable use of the Reef ecosystem subject to the overarching objective of long term protection and conservation; and to provide for meeting Australia's international responsibilities for the Reef World Heritage Area under the World Heritage Convention (Merrie, 2010). The 2009 Agreement provides a contemporary arrangement for cooperation between Queensland and Australian governments and recognises the jurisdictional framework governing the Great Barrier Reef World Heritage Area and adjacent Great Barrier Reef coastal zone (Strategic Assessment, 2014).

In order to implement the agreement, both governments agreed to apply a number of guiding principles including Ecosystem-Based Management, Precautionary Principle, Principles of Ecologically Sustainable Use, and Integrated Management (Merrie, 2010). The agreement also contains provisions on the formation of a Ministerial forum to implement the objectives of the Marine Park Act including joint policy development and coordination; ensure integrated and Ecosystem-Based Management approach; and consider the condition of the Reef ecosystem periodically (Merrie, 2010).

5.5. Outlook Report 2009

In 2006, the Australian Government make a decision to assess the performance of the Marine Park Act by Outlook Report for long-term and better protection of the Park. Correspondently, the Marine Park Act was amended in 2007 to prepare Outlook Report by the Park Authority after every five years. Accordingly, the Park Authority prepared the Outlook Reports of 2009 and 2014.

The maiden Outlook Report 2009 is structured for the assessment of biodiversity, ecosystem health, commercial and non-commercial use, the risk of the reef, ecosystem resilience and existing protection and management under the Act (Outlook Report, 2009).

The assessment on Biodiversity demonstrates that the overall area of mangrove forest adjacent to the Great Barrier Reef appears to be generally stable except where there is significant coastal development (Outlook Report, 2009). Populations appear to be intact for the vast majority of species or groups of species in the Great Barrier Reef ecosystem although some inshore habitats (such as coral reefs) have deteriorated, caused mostly by reduced water quality and rising sea temperatures (Outlook Report, 2009).

The assessment on Ecosystem Health states that most ecological processes remain intact and healthy on the Great Barrier Reef although chemical environment has deteriorated significantly (Outlook Report, 2009). However, the Report alarms that further declines in physical and chemical processes are expected to affect them in the future. In commercial and non-commercial use, the assessment grade is very good either through extraction of those resources or through tourism and recreation (Outlook Report, 2009). 'Tourism makes a significant contribution to the presentation, management and economic value of the Great Barrier Reef' (Outlook Report, 2009, p.84). 'The opportunity to enjoy the Region's environment continues to be of social value to Queensland residents, other Australians and international visitors' (Outlook Report, 2009, p.85).

Concerning the risk of the Park, the Report demonstrates that climate change, particularly rising sea temperatures and ocean acidification, has already affected the ecosystem of the Park, and over the next 50 years it is likely to significantly affect most components of the ecosystem (Outlook Report, 2009). The ecosystem of the Park is at high risk from the compounding impacts of climate change, catchment runoff, coastal development and extractive use. Ocean acidification is an emerging serious threat to the ecosystem of the Park (Outlook Report, 2009).

The assessment on Ecosystem Resilience shows that some disturbed populations and habitats have demonstrated recovery after disturbance (for example coral reefs, lagoon floor, coral trout, humpback whales) although some species recovery has been very slow, for example, loggerhead turtles (Outlook Report, 2009).

The assessment on the existing protection and management documents that many biodiversity protection measures, for example, zoning plans, are making a difference, but there is no overarching framework to guide and coordinate management actions (Outlook Report, 2009). The Report identifies the following loopholes in planning and management of the Park: lack of integrated planning, resources and enforcement in managing coastal development; less focus on adaptation and improving resilience for climate change; lack of information and coordination; lack of overall strategic planning; and gap of overall scientific research (Outlook Report, 2009).

5.6. Outlook Report 2014

The Great Barrier Reef Outlook Report 2014 is the second in the series, which for the first time, includes the heritage values for assessment. This assessment responds to both revised requirements of the Marine Park Act and a World Heritage Committee request for an explicit assessment of the world heritage area's outstanding universal value (Outlook Report, 2014). The summary of assessment result shown in Table 2.

The Assessment of Biodiversity shows that the habitats of the northern third of the Park are believed to remain in very good condition and is able to support dependent species. Moreover, some species have a good recovery after past serious declines: humpback whales, estuarine crocodiles, loggerhead turtles and green turtles (southern stock) (Outlook Report, 2014).

The assessment grade on Heritage values with the connection to the cultural practices and customs is poor. However, the scale on historical heritage value, social and scientific value are quite satisfactory. Similarly, the grade for national and world heritage value is also in a good position. In further, the outstanding universal value of the world heritage property remains in good condition. However, the overall condition of some key attributes is poor, and many have deteriorated since the property's listing in 1981 (Outlook Report, 2014).

In the liner, the assessment on ecosystem health shows that climate change remains as an influencing factor to have a high impact on ecological value, heritage value and economic value except for social value which has a low impact of climate change (Outlook Report, 2014). Compared to other values, the performance grade on commercial and non-commercial use is very good and stable. 'The economic contribution of the Great Barrier Reef to the Australian economy has increased from approximately $5.4 billion in 2006–07 to $5.6 billion in 2011–12' (Outlook Report, 2014, p.143). 'There has also been an increase in the full-time positions that are dependent on the Reef from 53,800 in 2006–07 to 69,000 in 2011–12' (Outlook Report, 2014, p.143). Marine tourism and recreational fishing are also in good and

Table 2
Summary of the assessment of the Outlook Report 2014 (Hockings et al, 2014).

Table 2: Summary of the assessment of the Outlook Report 2014 (Hockings et al, 2014).

	Topic	Context	Planning	Inputs	Process	Outputs	Outcomes
Managing Direct use of the Region	Commercial marine tourism	↔	↓	↘	↓	↔	↔
	Defence activities	↔	↘	↓	↔	↔	↔
	Fishing	↔	↔	↔	↔	↔	↔
	Ports	—	—	—	—	—	—
	Recreation	↔	↔	↘	↘	↔	↔
	Research activities	↗	↓	↓	↓	↔	↔
	Shipping	—	—	—	—	—	—
	Traditional use of marine resources	↗	↑	↑	↗	↔	↑
Managing external factors influencing the Region	Climate Change	↓	↓	↘	↓	↔	↓
	Coastal development	↗	↗	↔	↔	↔	↔
	Land-based run-off	↔	↑	↗	↑	↑	↔
Managing to protect the Region's Values	Biodiversity values	↔	↔	↔	↔	↔	↘
	Heritage values	↓	↓	↔	↘	↘	↘
	Community benefits of the environment	—	—	—	—	—	—

Management effective assessment is colour coded:
Effective Mostly effective Partially effective Ineffective
Trends are indicated by arrows:
↑ Trend since 2009 has been an upwards change in grade
↗ Trend since 2009 is increasing but has not caused an upwards grade change
↔ Grade has remained stable compared to 2009 with no major trends
↘ Trend since 2009 is decreasing but has not caused a downwards grade change
↓ Trend since 2009 has been a downwards change in grade
— No trend provided because the topic was not assessed in 2009.

stable positions (Outlook Report, 2014). The assessment of the risk of the Park documents that the risk of climate change including land-based run-off, coastal development and some aspects of direct use (particularly fishing) are predicted to continue (Outlook Report, 2014).

The assessment outcome on resilience shows that the grade on improving heritage resilience is good because of strong regulatory protection and regular maintenance (Outlook Report, 2014). The assessment on the existing protection and management identifies that the performance of the Marine Park Act on planning, management system and process, and delivery of outputs are good and satisfactory while understanding of context is in the position of very good (Outlook Report, 2014).

6. Evaluation

The Act adopted Zoning as a practical strategy to remove conflicting human activities in the Park. The Zoning strategy was, then, included and responded with the impact of the human activities on the ecosystem of the Park, and led to a strategic plan for conservation of the ecosystem. Zoning strategic plan focused on the protection of biodiversity. The Act also provided for monitoring and evaluation mechanism to assess the achievement and shortcomings of the Act in the implementation of MSP to achieve the objective of the Act. The Review of 2006 and Outlook Reports are the outcome of the mechanism to depict the achievement and shortcoming of the Act. The achievement and shortcomings under the Review Report, 2006 and the Outlook Report, 2009 are shown in Table 3.

Table 3
The achievements and shortcomings from 2006 to 2009.

Assessment criteria	Performance grade under the Review Report, 2006			Performance grade under the Outlook Report, 2009		
	Good	Partially Good	Poor	Good	Partially Good	Poor
Biodiversity		X			X	
Ecosystem Health		X			X	
Commercial Use		X		X		
Non-commercial Use			X	X		
Risk of the Park			X			X
Ecosystem Resilience			X		X	
Protection		X			X	
Management			X		X	
Heritage Value	X					

The Review Report, 2006 reviewed the Act to find out the achievements and shortcomings in the arrangements, efficiency, effectiveness and consistency in management until 2005. The Review Panel explored that the Act had a significant contribution in establishing a uniform legal framework and umbrella institution, the Park Authority, for integrated management and operation of the Park. The Marine Park

Act established a multiple uses marine park by zoning (Review Report, 2006).

The performance of the Act in conservation biodiversity, ecosystem health and protection of the Park is partially effective, which is stable between 2005 and 2009. The subsequent initiatives taken after theReview Report, 2006 had impact to improve both economic/commercial and non-commercial benefits in the Park. Particularly, the Act achieved a significant progress in confirming non-commercial (social and recreational) use. The performance of the Act as to prevent risk of the Park including climate change is constant at poor during the period. However, there is a considerable progress in ecosystem resilience and effective management of the Park. The heritage value of the Park was well protected until 2005 although it was not assessed under the Outlook Report, 2009 and can't be compared.

Based on the shortcomings, the Review Panel suggested three changes be incorporated in the Marine Park Act. Firstly, the Act should be modified with updated concepts and approach making it better aligned with the Environment protection. Better transparency, accountability and engagement with stakeholders are also recommended for the long-term and sustainable protection of the Marine Park (Review Report, 2006). Improvements are essential to increase the capacity of governments and the Authority to deliver long-term protection goals of the Reef (Review Report, 2006). Secondly, overlapping and inconsistency as to environmental impact assessment and licensing process should be amended to make uniform provisions. Thirdly, the Act should be standardizing compared to other counterpart legislation, for instance, the Environment Protection and Biodiversity Conservation Act 1999 (Review Report, 2006). Updating and streamlining the regulatory framework and ensuring effective involvement across all stakeholders are highlighted in this respect (Review Report, 2006).

In response to the Review Report 2006, the maximum of the recommendations was incorporated into the Act to move out the lacunas for efficient and effective management. Modernisation of the Marine Park Act by incorporating some contemporary management principles such as ecologically sustainable development and EBM, better aligned with the EPBC and reduce unnecessary duplications between the Queensland legislation and the Commonwealth were incorporated in the Marine Park Act. In order to achieve a cohesive and integrated operation of the legislative scheme, the Marine Park Act would enjoy the precedence over others if the activity is within the Marine Park. For example, the Marine Park Act would apply to both Queensland and Commonwealth water in the Region and while the EPBC Act provides an overarching basis for Environmental impact assessment for activities in Commonwealth areas this responsibility, as well as regulatory permitting functions, would generally remain with the Authority (Review Report, 2006). All these have provided an opportunity for a broader framework of integration in managing the multiple uses of the Marine Park. The operations of the Park Act and the EPBC Act in an integrated and cohesive manner have also brought significant development in implementing ecologically sustainable management principles and thus MSP in the region. The impact of these actions are reflected in the Outlook Report, 2009.

On protection of the Biodiversity, the overall area of mangrove forest adjacent to the Park was generally stable and population was intact for the vast majority of species or groups of species. However, some inshore habitats (such as coral reefs) have deteriorated, caused mostly by reduced water quality and rising sea temperatures. On the Ecosystem Health, most ecological process was intact and healthy in the Park except chemical environment which was significantly deteriorated. Many biodiversity protection measures, for example zoning plans, were success to protect the biodiversity of the Park, but there is no overarching framework to guide and coordinate management actions. In contrast, the Park was in continuous risk of climate change, particularly rising sea temperatures and ocean acidification, which had already affected the ecosystem of the Park; and over the next 50 years it is likely to significantly affect most components of the ecosystem (Merrie, 2010). Although the Act was partially successful in protecting the environment and ecosystem, it had a significant frustration in protecting from the impact of climate change in the Park.

Table 4
Achievements and shortcomings from 2009 to 2014.

Assessment criteria	Performance grade under the Outlook Report, 2009			Performance grade under the Outlook Report, 2014		
	Good	Partially Good	Poor	Good	Partially Good	Poor
Biodiversity		X		X		
Ecosystem Health		X				X
Commercial Use	X			X		
Non-commercial Use	X			X		
Risk of the Park			X			X
Ecosystem Resilience		X				X
Protection		X		X		
Management		X		X		
Heritage Value				X		

In contrast, the Outlook Report, 2009 shows that the response to the Review Report, 2006 had contributed to confirm integrated, efficient and effective management in the Park. In liner, the Marine Park Act was partially success in ecosystem resilience in the Park. Some disturbed populations and habitats have demonstrated recovery after disturbance (for example coral reefs, lagoon floor, coral trout, humpback whales) although some species recovery has been very slow, for example, loggerhead turtles. However, the performance of the Marine Park Act on commercial, economic and social benefits was good and stable since the beginning to 2009.

However, the overall outlook for the Park is poor. Even with the recent initiatives to improve resilience, catastrophic damage to the Great Barrier Reef ecosystem may not be averted (Outlook Report, 2009, p.180).

Then the performance of the Act is evaluated through the Outlook Report, 2009, 2014. The assessment and evaluation are presented in Table 4.

On Biodiversity, the Marine Park Act achieved a substantial progress through efficient and effective management. The Outlook Report, 2009 shows that the performance in the conservation of biodiversity was partially good whereas the Outlook Report documents that the performance is almost good in all aspects. The habitats of the northern third of the Region are believed to remain in very good condition and are able to support dependent species. Moreover, some species have a good recovery after past serious declines: humpback whales, estuarine crocodiles, loggerhead turtles and green turtles (southern stock).

On ecosystem health, the Outlook Report, 2009 depicts that the performance level was partially good as most ecological process was intact and healthy in the Park except chemical environment which was significantly deteriorated. But the assessment under the Outlook Report, 2014 reveals that the performance level is poor to protect and conserve ecological health of the Park. Climate change remains as an influencing factor to have a high impact on ecological value (Outlook Report, 2014).

The performance of the Act concerning both commercial use and non-commercial use (social use) are stable on good level either through extraction of those resources or through tourism and recreation under the Outlook Reports of 2009 and 2014. In contrast, achievement in mitigating the risks of the Park, both Outlooks Reports remain in poor performance. The ecosystem of the Park is at high risk from the compounding impacts of climate change, catchment runoff, coastal development and extractive use. Ocean acidification is an emerging serious threat for the ecosystem of the Park (Merrie, 2010). Moreover, across all fisheries risks to the ecosystem remain, especially from overfishing

of some predators, incidental catch of species of conservation concern, effects on other discarded species and fishing of unprotected spawning aggregations. Illegal fishing continues to be a very high risk to the Reef. While understanding of commercial fishing has improved, recreational fishing and the cumulative impacts of fishing remain poorly understood (Outlook Report, 2014).

The Outlook Report, 2009 depicts that the performance of the Act on resilience was partially good. But the level has decreased to poor performance until the Outlook Report, 2014. There are significant losses in coral cover and declines in ecosystem health in the inshore, southern two-thirds of the Region are likely to have affected some key ecological processes such as connectivity, reef building and recruitment (Outlook Report, 2014). Moreover, impacts from overfishing and illegal fishing and poaching as the priority issues are reducing the resilience of the Park (Outlook Report, 2014). A study undertaken by scientist from the Australian Marine Research Institute and the University of Wollongong reported that the coral over the heritage listed reef has lost half of its coral cover in the past 27 years and could halve again if trends continued (AIM, 2012).

On the assessment of the existing protection and management, the Outlook Report, 2009 documents that many biodiversity protection measures, for example zoning plans, were good although it lacks integrated management and coordination in the implementation of MSP in the Park (Merrie, 2010). But the performance has improved significantly until 2014. The assessment on the existing protection and management under the Outlook Report, 2014 provides that the performance of the Marine Park Act on planning, management system and process, and delivery of outputs are good and satisfactory while understanding of context is in the position of very good (Outlook Report, 2014).

The assessment on Heritage value, which was added for the first time in the Outlook Report, 2014, shows a good scale performance of the Marine Park Act. The scale on historical heritage value, social and scientific value are quite satisfactory. National and world heritage value is also in a good position. The outstanding universal value of the world heritage property remains in good condition. The management practice are not efficient to protect the ecological value of the Park (Goldberg et al., 2016).

Overall, the performance of the Act concerning commercial and non-commercial uses is stable and good. Moreover, the Marine Part Act has progressed towards better performance in heritage value, biodiversity, protection and management aspects of the Park. In contrast, the performance has decreased to poor on Ecosystem Health and Ecosystem resilience. The assessment as to the risk of the Park by climate change remains at the same grade of poor performance until 2014. The current MSP in the Park lacks the geospatial analysis, remote sensing, molecular techniques, telemetry and modelling to understand the spatial and temporal dynamics of marine organisms and ecosystems (Alam, 2016). This lack is an important reason to address the ecosystem health and resilience under the current management mechanism of the Park.

7. Conclusion

The Act has provided a uniform legal and institutional framework for the management of a multiple use Park. The Act provided spatial zoning and implemented MSP for ecologically sustainable use and management of the Park. The Act has a considerable achievement in economic benefit (commercial use), social value (non-commercial use), heritage value, biodiversity, protection and management of the Park. MSP has rendered an effective management of the human activities for commercial and non-commercial use in the Park. However, the shortcomings of the Act are inadequacy to address ecosystem health, ecosystem resilience, marine pollution and risk of climate change. There are declining tendencies to poor performance in the Ecosystem health, the Risk of the park and the ecosystem resilience from 2009 to 2014. That means the conservation of the whole Park is at high risk, although biodiversity might be good. Although many of the objectives have been achieved, more need to be done to achieve the objectives of ecologically sustainable use. The Act should prescribe for an overall strategic plan. The Strategic Plan should provide explicit guidance on how to assess potential ecological risks and consequences of the Park. The geospatial analysis, remote sensing, molecular techniques, telemetry and modelling should be in the MSP process of the Park for effective EBM. Some general recommendations on resilience improvement and impact amplification of the Plan will fall into the integration of diverse aspects: the Plan should incorporate provisions to mitigate climate change within the Park, particularly, ocean acidification; the relevant stakeholders and NGOs working with climate change aspects and marine environment should be engaged in the management process; the federal and state government should work together through a meaningful cooperation for the better protection of the Park.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ocecoaman.2018.10.015.

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